



Arizona Department of Transportation

Environmental Planning

Final Noise Report

Chandler Heights Road (McQueen Road to Gilbert Road)

**Federal Project NO. CHN-0(240)D
ADOT TRACS NO. 000 MA CHN T0099 01C**

May 10, 2018

Submittal Number 2

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Ivan Racic
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May 10, 2018

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EXECUTIVE SUMMARY

The City of Chandler (City), in coordination with the Arizona Department of Transportation (ADOT), proposes to improve Chandler Heights Road from McQueen Road to Gilbert Road. The project is located within the City of Chandler, Maricopa County, Arizona.

The proposed improvements include widening Chandler Heights Road to accommodate two thru lanes in each direction, bike lanes, a raised median island, curb, gutter, and sidewalks; reconstructing driveways and sidewalk ramps to meet Americans with Disabilities Act (ADA) requirements; constructing drainage improvements such as scuppers, inlets, retention basins and storm drain; removing signs and providing new signing; obliterating pavement striping and replacing striping as needed; replacing the traffic signal at Chandler Heights Road/Adams Avenue intersection; relocating Roosevelt Water Conservation District (RWCD) and private irrigation facilities; improving signal interconnect and street light improvements and converting all existing high pressure sodium (HPS) street lights to light-emitting diode (LED) street lights; installing or restoring landscaping and irrigation; installing or rehabilitating public water, sanitary sewer, and reclaimed water systems; replacing six-inch asbestos-cement pipe (ACP) waterline along Chandler Heights Road east of McQueen Road; relocating overhead electric and underground electric, gas, fiber optic, telephone and cable television (TV); replacing or rehabilitating waterline and sewer manhole improvements; geotechnical and potholing investigations; obtaining new right-of-way (ROW), public utility easements (PUE), drainage easements (DEs); RWCD irrigation easements, and temporary construction easements (TCEs).

This analysis was performed in compliance with the current (May 2017) ADOT *Noise Abatement Requirements* (NAR), as well as Title 23 Code of Federal Regulations, Part 772 (23 CFR 772). The ADOT NAR establishes official policy on highway noise and describes the process that is used in determining traffic noise impacts and evaluating abatement measures.

The ADOT NAR is based on the noise levels approaching the FHWA NAC. ADOT defines “approaching” as within 1 dBA of the FHWA NAC for Activity Categories A, B, C, D, and E. There are no noise impact thresholds for Activity Category F or G. FHWA and ADOT require that feasible and reasonable measures be considered and evaluated to abate traffic noise at all identified traffic noise impacts.

Short-term noise level monitoring was conducted within the project limits on March 27, 2018 to describe the existing noise level environment. Seven measurement locations were chosen to represent noise sensitive receptors in commercial and residential communities along the project corridor.

Noise level monitoring helps describe the existing noise environment throughout the project area and capture the contribution of traffic noise from surrounding roadways. Three 15-minute interval equivalent noise level measurements (Leq) were conducted at each site.

The FHWA approved Traffic Noise Model version 2.5 (TNM 2.5) was used to predict the highway traffic noise levels. Highway traffic noise levels are dependent on several variables such as roadway geometry, topography, traffic volume, vehicle type, vehicle speed, terrain types, and location of noise receptors.

Future build (2040) traffic noise is not predicted to impact any of the noise sensitive receptors.

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1.0 PROJECT INFORMATION

The City of Chandler (City), in coordination with the Arizona Department of Transportation (ADOT), proposes to improve Chandler Heights Road from McQueen Road to Gilbert Road. The project is located within the City of Chandler, Maricopa County, Arizona.

The proposed improvements include widening Chandler Heights Road to accommodate two thru lanes in each direction, bike lanes, a raised median island, curb, gutter, and sidewalks; reconstructing driveways and sidewalk ramps to meet Americans with Disabilities Act (ADA) requirements; constructing drainage improvements such as scuppers, inlets, retention basins and storm drain; removing signs and providing new signing; obliterating pavement striping and replacing striping as needed; replacing the traffic signal at Chandler Heights Road/Adams Avenue intersection; relocating Roosevelt Water Conservation District (RWCD) and private irrigation facilities; improving signal interconnect and street light improvements and converting all existing high pressure sodium (HPS) street lights to light-emitting diode (LED) street lights; installing or restoring landscaping and irrigation; installing or rehabilitating public water, sanitary sewer, and reclaimed water systems; replacing six-inch asbestos-cement pipe (ACP) waterline along Chandler Heights Road east of McQueen Road; relocating overhead electric and underground electric, gas, fiber optic, telephone and cable television (TV); replacing or rehabilitating waterline and sewer manhole improvements; geotechnical and potholing investigations; obtaining new right-of-way (ROW), public utility easements (PUE), drainage easements (DEs); RWCD irrigation easements, and temporary construction easements (TCEs).

2.0 PROCEDURES

This Draft Noise Report represents the preliminary analysis of the effects of traffic and construction generated noise that can be expected to occur during and after the construction of the Chandler Heights Road improvements project in Chandler, Arizona. The project location is shown in **Figure 1** and project vicinity maps are shown in **Appendix A**.

This analysis was performed in compliance with the current (May 2017) ADOT *Noise Abatement Requirements* (NAR), as well as Title 23 Code of Federal Regulations, Part 772 (23 CFR 772). The ADOT NAR establishes official policy on highway noise and describes the process that is used in determining traffic noise impacts and evaluating abatement measures.

In accordance with the ADOT NAR, the FHWA Traffic Noise Model® (TNM 2.5) was used to predict existing and future design year 2040 hourly equivalent traffic noise levels, $L_{eq(h)}$, for the noise-sensitive receptor locations in the vicinity of the proposed improvements project.

Figure 1: Project Location

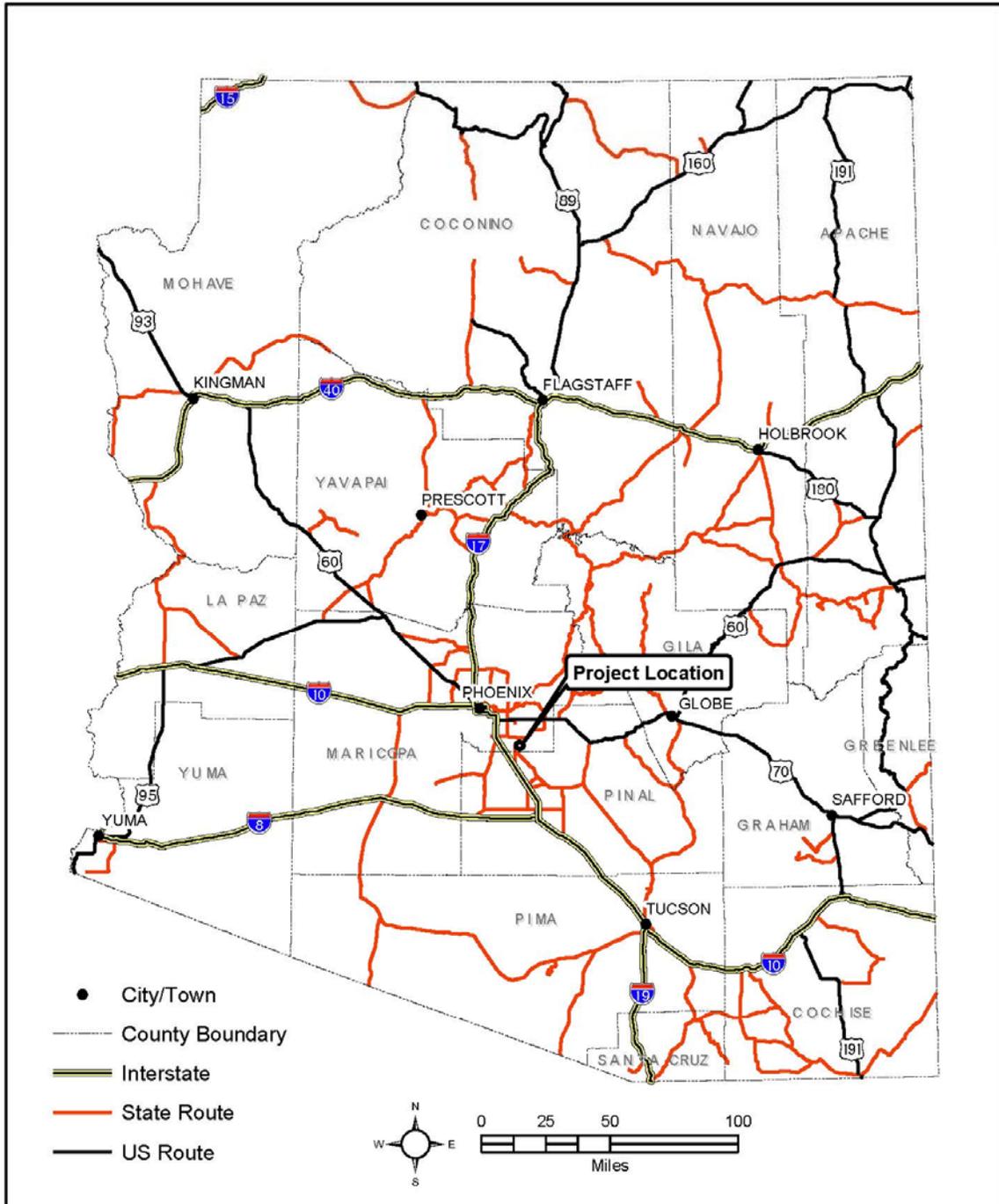


Figure 1. State Map
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Chandler Heights - McQueen Rd to Gilbert Rd

Figure 2: Project Vicinity Map 1

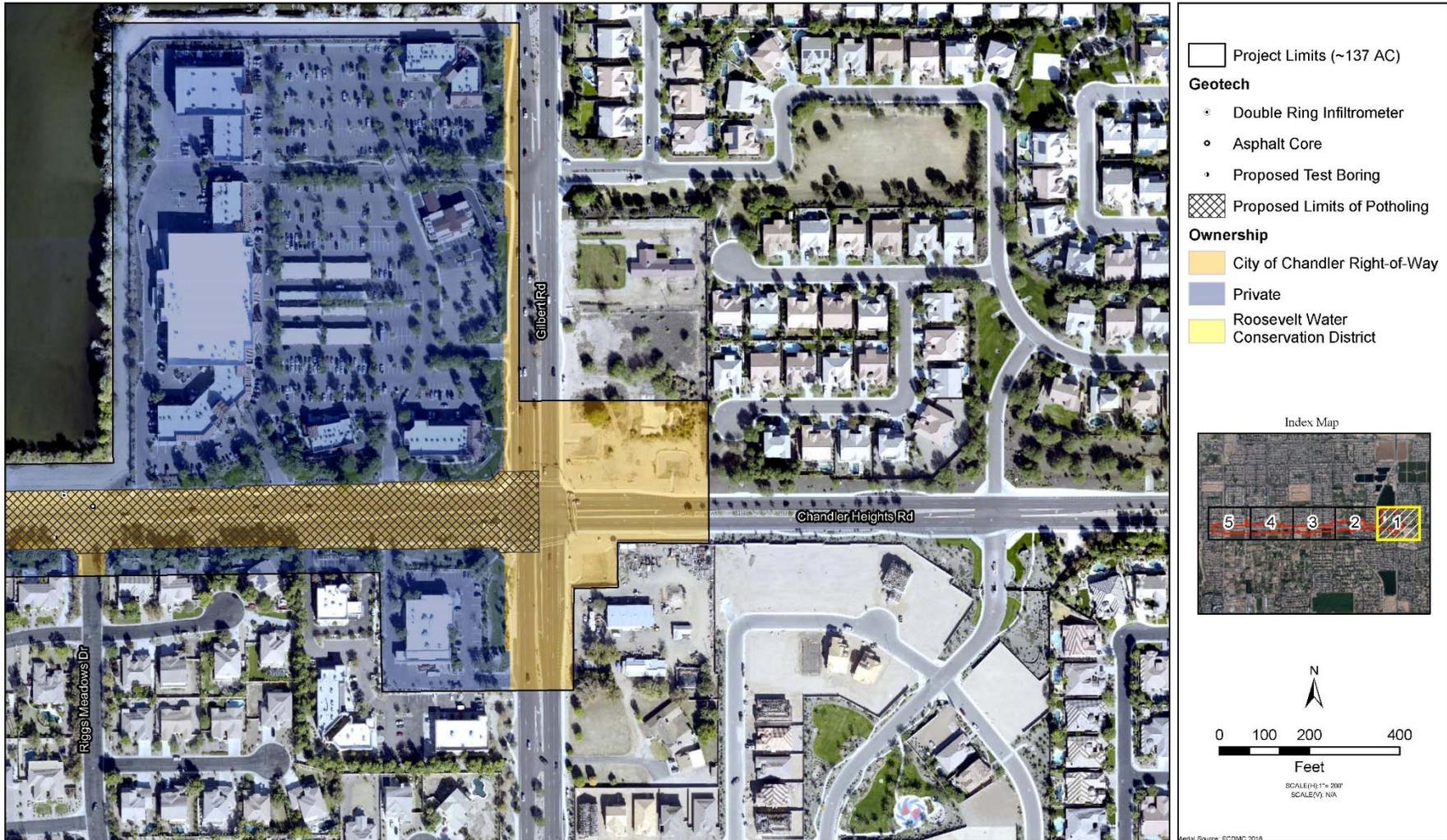


Figure 2. Vicinity Map (Sheet 1 of 5)
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 Chandler Heights - McQueen Rd to Gilbert Rd

Figure 2: Project Vicinity Map 2

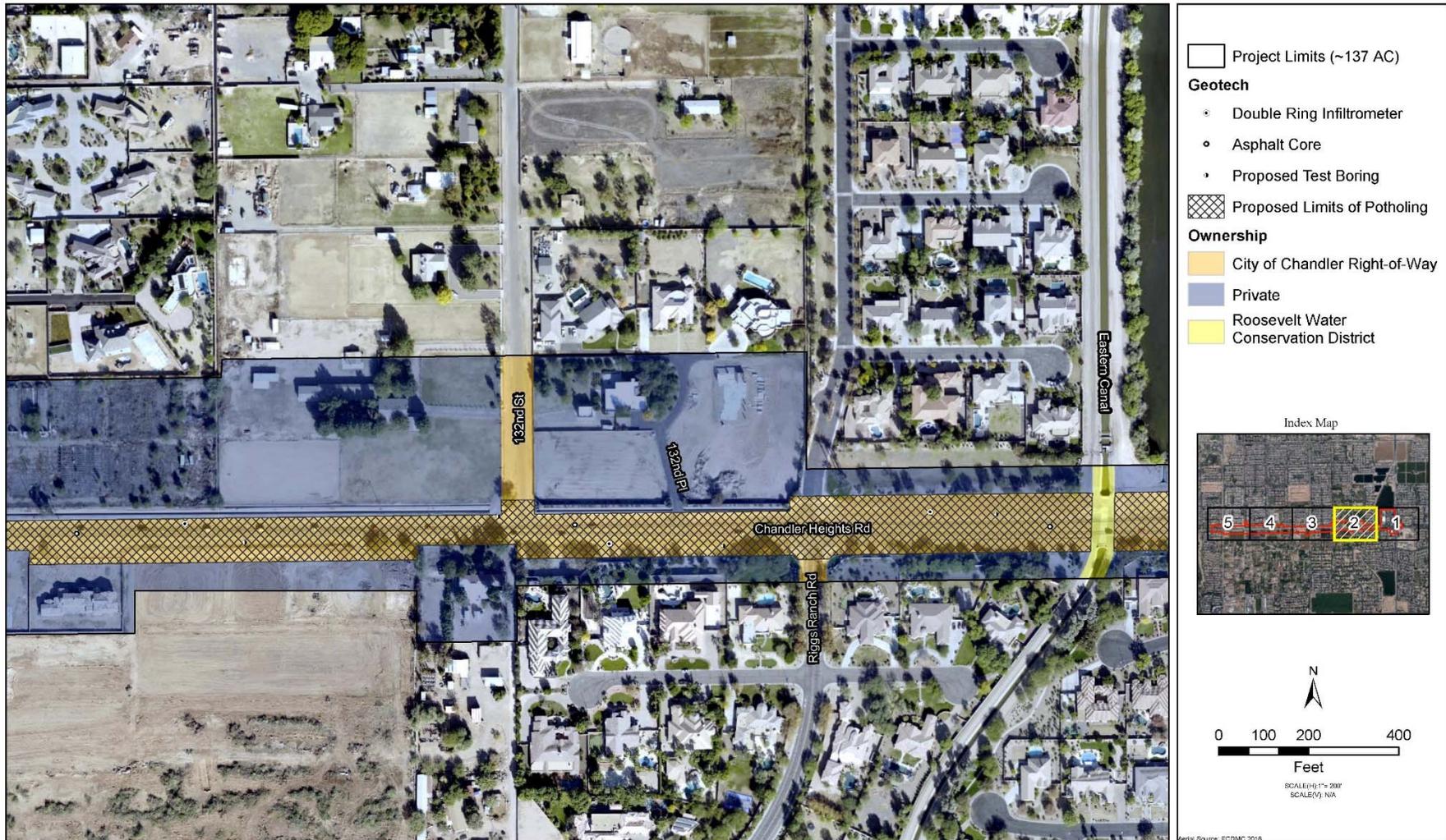


Figure 2. Vicinity Map (Sheet 2 of 5)
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 Chandler Heights - McQueen Rd to Gilbert Rd

Figure 2: Project Vicinity Map 3



Figure 2. Vicinity Map (Sheet 3 of 5)
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 Chandler Heights - McQueen Rd to Gilbert Rd

Figure 2: Project Vicinity Map 4



Figure 2. Vicinity Map (Sheet 4 of 5)
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 Chandler Heights - McQueen Rd to Gilbert Rd

Figure 2: Project Vicinity Map 5

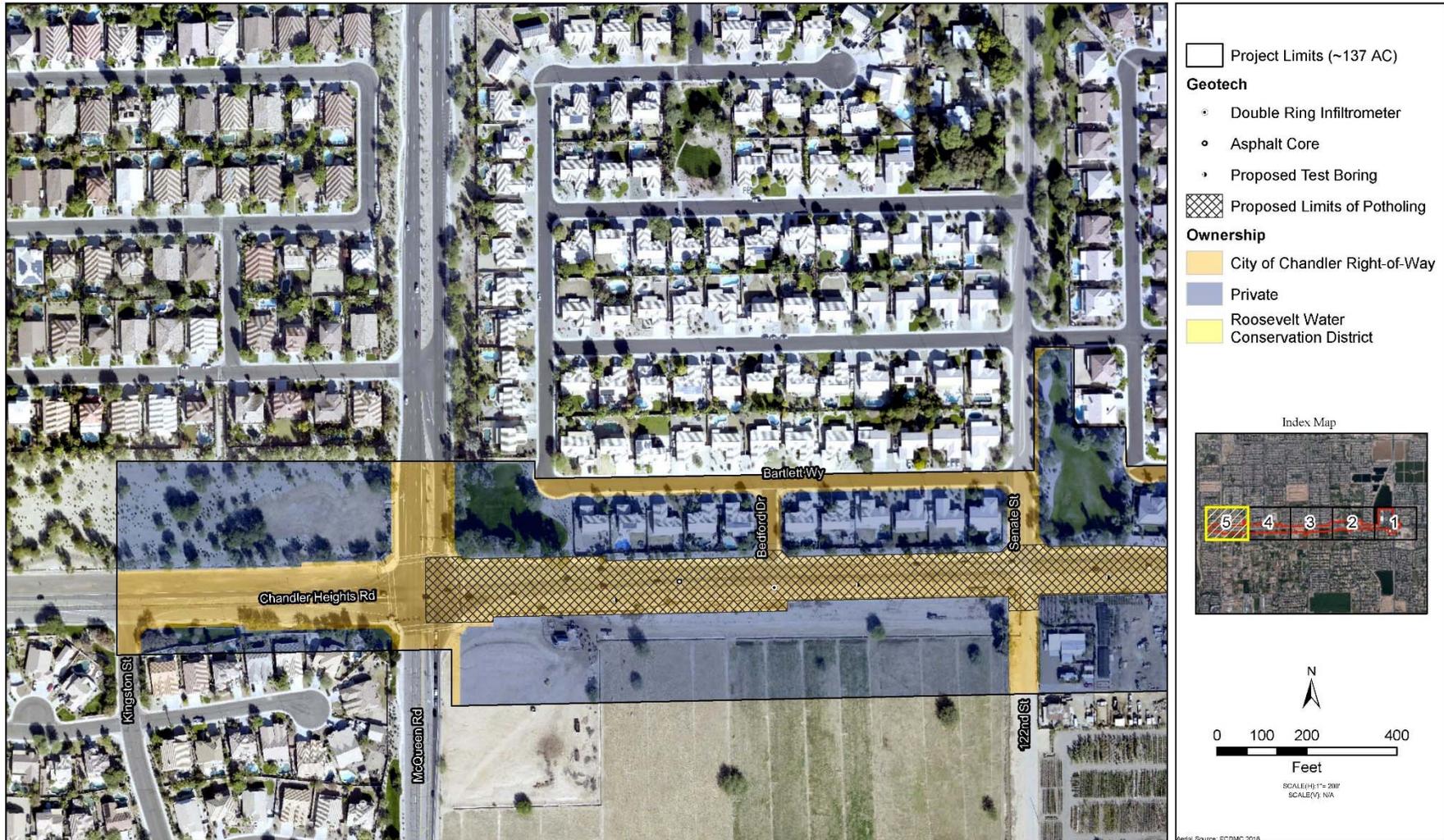
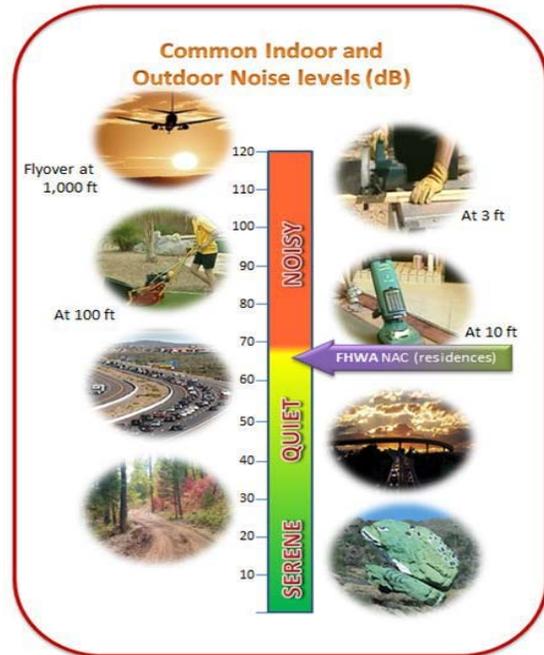


Figure 2. Vicinity Map (Sheet 5 of 5)
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 Chandler Heights - McQueen Rd to Gilbert Rd

3.0 FUNDAMENTALS OF TRAFFIC NOISE

Sound is the sensation produced by stimulation of the hearing organs produced by continuous and regular vibrations of a longitudinal pressure wave that travels through an elastic medium (air, water, metal, wood) and can be heard when they reach a person's or animal's ear. When sound travels through air, the atmospheric pressure wave variations occur periodically. It travels in air at a speed of approximately 1087 feet per second at sea level and temperature of 32 °F. Noise is usually defined as any “unwanted sound,” and consists of sounds that are perceived as interfering with communication, work, rest, and recreation. It is characterized as a non-harmonious or discordant group of sounds.



Sound Pressure Levels, Decibels, Frequencies and A-Weighted Decibels-dBA

Noise can be measured in Pa (Pascal). A healthy human ear can detect a pressure variation of 20 μ Pa and it is referred to as threshold of hearing. Logarithmic scale is useful for handling numbers on a wide scale, but for a smaller span, the decibel or (dB) scale is used. Sound pressure level (SPL) is calculated using measured sound level and the hearing threshold of 20 μ Pa or 20×10^{-6} Pa as the reference level, this level can also be defined as 0 dB. The decibel alone is insufficient to describe how human ear responds to sound pressures at all frequencies. The human ear has peak response in the range of 2,500 to 3,000 Hz and has a somewhat low response at low or even high frequencies. In response to the human ear sensitivity, the A-weighted noise level, referenced in units of dBA, was determined to better resemble people's perception of sound levels. This dBA unit of measurement is used in noise studies and reporting. Changes in sound level under 3 dBA are not noticed by human ear, while the human ear perceives a 10 dBA increase in sound level to be a doubling of sound.

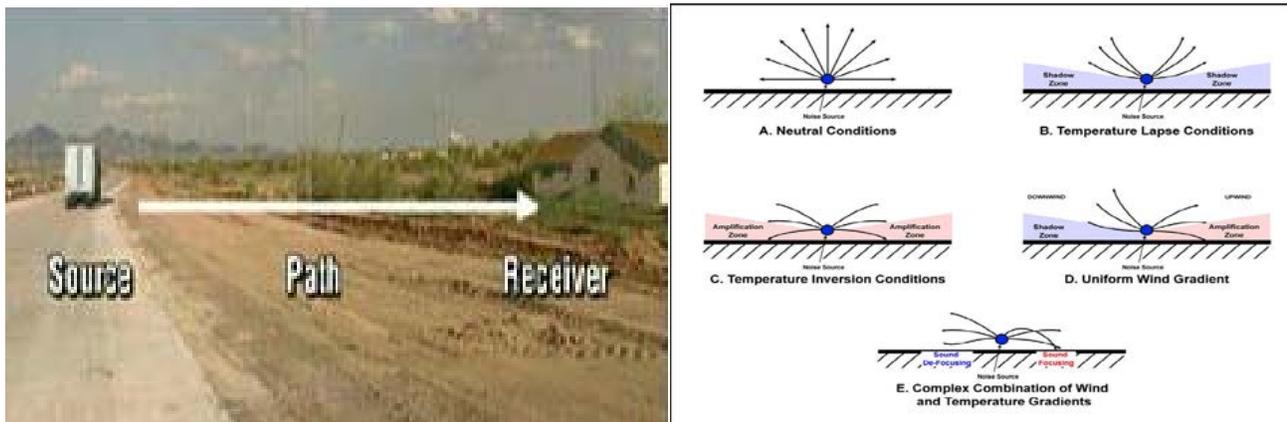
Noise Descriptors

The most commonly used noise descriptor in traffic noise analysis is Equivalent Sound Level (Leq). Leq represents an average of the sound energy occurring over a specified period. In effect, Leq is the steady-state sound level containing the same acoustical energy as the time-varying sound that actually occurs during the same period. The 1-hour A-weighted equivalent sound level [LAeq(h)] is the energy average of A-weighted sound levels occurring during a one-hour period, and is the basis for noise criteria used by ADOT.

What are source, receiver, receptor, and path when talking about traffic noise?

Traffic noise is a combination of the noises produced by vehicle engines, exhaust, and tires. The source of highway traffic comes from vehicles traveling on highways. The noise level at the Source depends on pavement type, number of heavy trucks, traffic volumes, and traffic speeds. The predominant noise sources in vehicles at speeds less than 30 mph are engine and exhaust. At speeds greater than 30 mph, tire noise becomes the dominant noise source.

In the illustration below, the Receptor is any location where people are affected by the traffic noise. It can be residence, park, school, playground and any other place where frequent human use occurs. An area between the source and the receptor (receiver represents a receptor(s) when modeled in FHWA Traffic Noise Model) is considered a path. Depending on the path surface, propagation of sound may be reduced; such is the case for the soft ground and fresh snow. Doubling the distance between the source and receptor reduces noise by three dBA depending on the ground.



Air changes its density due to variation of humidity and temperature, and wind influences refraction of sound waves. Wind, humidity, and temperature may have a significant impact, but only influences the receptors located a long distance away from source. As residents are usually much closer to the noise source, any atmospheric conditions are insignificant for consideration.

For more information on noise, please visit ADOT Environmental Planning Noise webpage.

4.0 NOISE ABATEMENT CRITERIA

The ADOT NAR provides the guidelines used to assess the potential negative impacts from highway traffic noise levels and determines the need for noise abatement. The noise level impact methodology used for this analysis is based on the current ADOT NAR. The Federal Highway Administration (FHWA) has established Noise Abatement Criteria (NAC) and procedures to be used in the planning and design of highways. A summary of the NAC for various land uses is presented in **Table 1**.

Activity Category	dB(A) $L_{eq(h)}$ ²	Activity Description
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Residential
C	67 (exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72 (exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	--	Agriculture, airports, bus yards, emergency services, industrial, logging maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	--	Undeveloped lands that are not permitted
¹ Federal Highway Administration (2011); 23 Code of Federal Regulations § 772 ² The 1-hour equivalent steady-state sound level in A-weighted decibels, which is the logarithmic average of noise over the same 1-hour time		

The ADOT NAR is based on the noise levels approaching the FHWA NAC. ADOT defines “approaching” as within 1 dBA of the FHWA NAC for Activity Categories A, B, C, D, and E. There are no noise impact thresholds for Activity Category F or G.

5.0 NOISE SENSITIVE LAND USES

The project area is comprised of Category B (residential), Category C (school), Category E (retail facilities), and Category G (undeveloped lands). This analysis focuses on representative noise sensitive receptors in Categories B, C, and E. There are several residential communities located both north and south of Chandler Heights Road. There are Activity Category C receivers placed at the Santan Junior High School. There are also several Category E and F receivers representing restaurants and commercial sites. **Appendix A** shows the receiver locations.

6.0 EXISTING NOISE ENVIRONMENT

Short-term noise level monitoring was conducted within the project limits on March 27, 2018 to describe the existing noise level environment. Seven measurement locations were chosen to represent noise sensitive receptors in the residential communities and at the Santan Junior High School.

Three 15-minute interval equivalent noise level measurements (L_{eq}) were conducted at each site. Noise level monitoring helps describe the existing noise environment throughout the project area and capture the contribution of traffic noise from surrounding roadways. Measured noise levels may include contributions from other noise source, including but not limited to, airplanes from Chandler Municipal Airport, wind, birds, insects, etc.

The equipment used for the noise level monitoring was a Larson Davis Model LXT Class 1 integrating sound level meter (SLM). The SLM was calibrated in the field before each measurement using a Larson Davis Model CAL200. Existing noise measurements were collected under meteorologically acceptable conditions when the pavement was dry and winds were calm or light. Additional data collected at each monitoring location included atmospheric conditions such as general wind speed and direction, humidity, dew point, pressure, and ambient temperature. Measurements were collected based on the acceptable collection of existing noise level readings per the FHWA report, FHWA-PD-96-046, and “Measurement of Highway Related Noise.”

The measured noise level ranged from 49 dBA to 69 dBA. **Appendix A** shows the location of the noise level monitoring sites, and **Table 2** shows the summary of the noise level measurements. **Appendix B** shows the noise measurement data.

TABLE 2 SUMMARY OF NOISE LEVEL			
Monitoring Site #	15-Minute Interval Measured Noise Levels (L_{eq}), dBA		
	Interval 1	Interval 2	In
Mon1	60.2	60.3	6
Mon2	69.4	69.1	69.3
Mon3	64.4	59.3	60.0
Mon4	54.1	53.6	54.5
Mon5	53.3	48.5	53.1
Mon6	56.0	56.1	56.2
Mon7	67.2	67.4	67.3

Note: **Bolded** values are equal to or greater than ADOT NAR noise impact threshold of 66 dBA.

7.0 MODELING METHODOLOGY

The FHWA approved Traffic Noise Model version 2.5 (TNM 2.5) was used to predict the highway traffic noise levels. Highway traffic noise levels are dependent on several variables such as roadway geometry, topography, traffic volume, vehicle type, vehicle speed, terrain types, and location of noise receptors.

7.1 Roadway Geometry and Topographic Data

The roadway geometry data used for the noise modeling was based on 60% design plans. The Build and No-Build model elements (roadways, barriers, receivers, etc.) were represented with zero height in the model to represent the propagation of sound between the source and the noise sensitive receptors based on the relatively flat terrain within the project corridor.

7.2 Traffic Volumes

The Existing, No Build, and Build scenario traffic volumes used in the noise analysis were provided by Kimley-Horn and Associates, Inc. and Lee Engineering and are shown in **Appendix C**.

7.3 Vehicle Mix

Different vehicle types produce different noise emission levels, with truck producing higher noise levels than automobiles. The vehicle mix used for all scenarios in this analysis is based on the following percentages:

- Automobile – 98%
- Medium Truck – 1%
- Heavy Truck – 1%

Automobiles are categorized as vehicles with two axles and four wheels designed primarily for passenger or cargo transportation. Generally, the gross vehicle weight of an automobile is less than 9,900 pounds. Medium trucks are categorized as vehicles having two axles and six wheels designed for the transportation of cargo. Generally, the gross vehicle weight of a medium truck is greater than 9,900 pounds but less than 26,400 pounds. Heavy trucks are categorized as all vehicles having three or more axles and designed for the transportation of cargo. Generally, the gross vehicle weight of a heavy truck is greater than 26,400 pounds.

7.4 Vehicle Speed

The vehicle speed for Chandler Heights Road was modeled at 50 miles per hour (mph), which is 5 mph higher than the currently posted speed limit of 45 mph. The school zone near Santan Junior High School was modeled at 35 mph.

7.5 Atmospheric Conditions and Ground Type

Sound levels are affected by various atmospheric conditions, such as temperature and humidity, as well as the type of ground the sound is traveling over. The FHWA recommends a default temperature of 68 °F and a default humidity of 50%. Ground type affects how noise propagates from the source to the receiver. The loose soil ground type was used to approximate the ground type between the roadway and receptors.

8.0 FUTURE NOISE ENVIRONMENT AND IMPACT DETERMINATION

Future build (2040) traffic noise is not predicted to impact any of the noise sensitive receptors. The location of the modeled receivers are shown in **Appendix A**. The predicted traffic noise impacts for each receiver are shown in **Table 3**.

TABLE 3 Modeled Noise Level Results					
Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
E1	Category B	2	SE Corner of Chandler heights Rd & McQueen Rd. Zoned Residential - The Reserve at Chandler Heights. Proposing 26 residential homes.	58	59
E2	Category B	2		53	54
E3	Category B	2		58	59
E4	Category B	2		52	53
E5	Category B	2		58	59
E6	Category B	2		52	53
E7	Category B	2		59	60
E8	Category B	2		53	53
E9	Category B	1	12215 E Chandler Heights Rd	52	53
E10	Category B	1	12447 E Chandler Heights Rd	52	49
E11	Category B	1	12515 E Chandler Heights Rd	52	50
E12	Category B	1	12605 E Chandler Heights Rd	52	52
E13	Category B	1	12647 E Chandler Heights Rd	51	51
E14	Category B	1	12653 E Chandler Heights Rd	50	51
E15	Category B	1	12749 E Chandler Heights Rd	53	53
E16	Category F	1	SW corner Chandler Heights Rd & Cooper Rd - Zoned Commercial	62	62
E17	Category B	1	12819 E Chandler Heights Rd	52	52
E18	Category B	1	12949 E Chandler Heights Rd	50	50
E19	Category B	1	5100 S Lafayette Dr	51	51
E20	Category B	1	2260 E Cherrywood Pl	54	55
E21	Category B	1	13007 E Chandler Heights Rd	53	54
E22	Category B	2	2280 E Cherrywood Pl	53	54
E23	Category B	2	5105 S Lafayette Dr	49	49
E24	Category B	1	2285 E Chandler Heights Rd	52	53
E25	Category B	2	2300 E Cherrywood Pl	54	55
E26	Category B	2	2360 E Cherrywood Pl	60	60
E27	Category B	3	2361 E Cherrywood Pl	53	54
E28	Category B	2	2380 E Cherrywood Pl	60	61
E29	Category B	1	13103 E Chandler Heights Rd	63	64
E30	Category B	2	2510 E Cherrywood Pl	59	59
E31	Category B	2	2550 E Cherrywood Pl	59	59
E32	Category B	2	2529 E Cherrywood Pl	50	50
E33	Category B	2	2600 E Cherrywood Pl	58	59
E34	Category B	2	2619 E Cherrywood Pl	50	50
E35	Category B	1	2640 E Cherrywood Pl	57	58
E36	Category B	3	2755 E Cherrywood Pl	52	53
E37	Category B	2	2786 E Cherrywood Pl	59	60
E38	Category B	2	2856 E Cherrywood Pl	60	60
E39	Category B	3	2875 E Cherrywood Pl	53	54
E40	Category B	1	2916 E Cherrywood Pl	60	60
E41	Category F	1	BMO Harris Bank	63	64
E42	Category F	1	CVS	63	64
W1	Category B	2	4920 S Springs Dr	50	50
W2	Category B	2	4960 S Springs Dr	53	53

**TABLE 3
Modeled Noise Level Results**

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
W3	Category B	2	1023 E Bartlett Way	59	60
W4	Category B	3	1022 E Bartlett Way	54	55
W5	Category B	3	1083 E Bartlett Way	61	61
W6	Category B	4	1102 E Bartlett Way	52	52
W7	Category B	2	1143 E Bartlett Way	60	61
W8	Category B	2	1183 E Bartlett Way	60	61
W9	Category B	3	1182 E Bartlett Way	51	51
W10	Category B	2	1243 E Bartlett Way	60	60
W11	Category B	2	1242 E Bartlett Way	52	53
W12	Category B	2	4930 S Husdon Pl	50	51
W13	Category B	3	1273 E Bartlett Way	60	60
W14	Category B	3	4931 S Husdon Pl	52	52
W15	Category B	3	1333 E Bartlett Way	60	60
W16	Category B	3	1352 E Bartlett Way	50	50
W17	Category B	2	1393 E Bartlett Way	61	60
W18	Category B	3	1412 E Bartlett Way	51	50
W19	Category B	2	1453 E Bartlett Way	61	58
W20	Category B	1	1494 E Chandler Heights Rd	63	59
W21	Category B	1	1494 E Chandler Heights Rd	56	53
W22	Category C	8	Santan Junior High School - 1550 E Chandler Heights Rd (1400 total students + teachers)	60	57
W22a	Category C	8		60	57
W22b	Category C	8		61	57
W22c	Category C	8		54	53
W22d	Category C	8		55	52
W22e	Category C	8		56	54
W22f	Category C	8		56	54
W22g	Category C	8		55	53
W22h	Category C	8		54	52
W22i	Category C	8		52	51
W22j	Category C	8		55	52
W22k	Category C	8		46	45
W22l	Category C	8		46	45
W22m	Category C	8		50	50
W22n	Category C	8		51	50
W22o	Category C	8		48	48
W22p	Category C	8		45	46
W22q	Category C	8		44	43
W22r	Category C	8		44	43
W22s	Category C	8		48	46
W22t	Category C	8		44	45
W22u	Category C	8	43	42	
W23	Category C	1		62	63
W23a	Category C	1		61	61
W24	Category C	2		59	59
W25	Category C	2		56	56
W26	Category C	1		58	64
W26a	Category C	1		58	61
W27	Category C	2		57	59
W28	Category C	2		54	56
W29	Category C	1		58	64
W29a	Category C	1		57	61
W30	Category C	2		55	58

**TABLE 3
Modeled Noise Level Results**

Receiver ID	NAC Category	No of Dwelling Units	Description of Receiver	No-Build 2040 (dBA)	Build (2040) dBA
W31	Category C	2		54	55
W32	Category B	1	1655 E Bartlett Pl	59	59
W33	Category B	2	1656 E Bartlett Pl	52	53
W34	Category B	2	1695 E Bartlett Pl	59	59
W35	Category B	2	1716 E Bartlett Pl	54	54
W36	Category B	2	1735 E Bartlett Pl	59	59
W37	Category B	3	1756 E Bartlett Pl	53	54
W38	Category B	3	1795 E Bartlett Pl	59	60
W39	Category B	3	1816 E Bartlett Pl	52	52
W40	Category B	3	1855 E Bartlett Pl	61	61
W41	Category B	4	1876 E Bartlett Pl	52	53
W42	Category B	3	1935 E Bartlett Pl	60	61
W43	Category B	3	1956 E Bartlett Pl	52	53
W44	Category B	3	1995 E Bartlett Pl	60	61
W45	Category B	2	4961 S Soho Ln	53	54
W46	Category B	1	2023 E Bartlett Pl	60	60
W47	Category B	3	2044 E Bartlett Pl	53	54
W48	Category B	2	2063 E Bartlett Pl	60	60
W49	Category B	2	2103 E Bartlett Pl	60	61
W50	Category B	3	2104 E Bartlett Pl	54	55
W51	Category B	2	2163 E Bartlett Pl	60	61
W52	Category B	3	2164 E Bartlett Pl	54	55
W53	Category B	2	2203 E Bartlett Pl	60	61
W54	Category B	2	2224 E Bartlett Pl	53	54
W55	Category B	1	2243 E Bartlett Pl	60	61
W56	Category B	1	13012 E Chandler Heights Rd	53	53
W57	Category B	1	23421 S 130th St	55	55
W58	Category B	1	23413 S 130th St	52	52
W59	Category B	1	13025 E San Carlos Pl	57	58
W60	Category B	1	13024 E San Carlos Pl	51	52
W61	Category B	1	23456 S 132nd St	51	51
W62	Category B	1	23410 S 132nd St	52	53
W63	Category B	1	235516 S 132nd Pl	50	50
W64	Category B	1	23508 S 132nd Pl	53	53
W65	Category B	1	Res on S 132nd Pl	50	51
W66	Category B	1	23505 S 132nd Pl	53	53
W67	Category B	1	2645 E Bartlett Pl	57	58
W68	Category B	3	2705 E Bartlett Pl	56	57
W69	Category B	4	2706 E Bartlett Pl	52	53
W70	Category E	1	ToScany's Coal Oven Pizza	64	65
W71	Category E	1	Starbucks	65	65
W72	Category E	1	Hong Kong Bistro	65	66

9.0 MITIGATION ANALYSIS

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with “approach meaning within 1 dBA of the NAC values listed in **Table 1** for Activity Category A, B, C, and D), or [b] substantially exceeding the existing noise levels (increase of 15 dBA or more).

FHWA and ADOT require that feasible and reasonable measures be considered and evaluated to abate traffic noise at all identified traffic noise impacts. Abatement measures include:

- Acquisition of Right-of-Way to provide a Buffer Zone
- Change of Horizontal or Vertical Alignment
- Insulation of Category D Land Uses
- Traffic Management Measures
- Noise Barriers

9.1 *Acquisition of Right-of-Way*

This abatement measure would serve to provide additional property alongside the proposed improvements project on which to construct noise barriers or to provide a buffer zone in which no noise sensitive land use would be permitted. The acquisition of right-of-way would not be necessary because there are no impacted receivers.

9.2 *Alteration of Horizontal and Vertical Alignments*

Alignment modification can serve to reduce noise impacts by either moving the source of noise away from the receiver or by depressing the roadway to block sound. The proposed alignment was selected based on a minimization of impacts to the surrounding environment, natural and human. Thus, highway alignment modifications are not necessary as there are no impacted receivers.

9.3 *Insulation*

Since no traffic noise impacts are predicted to occur for interior noise-sensitive areas (NAC “D”), interior noise insulation was not considered as a potential traffic noise impact mitigation measure for this project.

9.4 *Traffic Management*

Measures such as traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, and modified speed limits can reduce noise impacts by reducing either the number of higher-impact vehicles or the overall vehicle speed within a project area. Prohibition of truck traffic, reduction of the speed limit below the existing and proposed speeds, or screening total traffic volumes would diminish the functional capacity of the major thoroughfare and are not recommended.

9.5 *Noise Barriers*

Sound barriers located between the source of noise and any receivers can abate noise impacts by blocking or deflecting sound waves. Noise barriers are effective because they absorb sound energy, extend the source-to-receptor sound transmission path, or both.

Highway sound barriers are primarily constructed as earth berms or solid-mass walls adjacent to limited-access freeways that are in proximity to noise sensitive land use(s). To be effective, a sound barrier must be long enough and tall enough to shield the impacted receptor(s). Generally, the noise wall length must be eight times the distance from the barrier to the receptor. On roadway facilities with direct access for driveways, sound barriers are typically not feasible because the openings render the barrier ineffective in impeding the transmission of traffic noise. Due to the requisite lengths for effectiveness, sound barriers are typically not economical for isolated or most low-density areas.

Consideration for noise abatement measures was not necessary because there are no impacted receptors in the future build scenario.

10.0 CONSTRUCTION NOISE

Although temporary in nature, construction noise can, at times, interfere with day-to-day activities of noise sensitive receivers.

The predominant construction activities associated with this project are expected to be earth removal, hauling, grading, and paving. Temporary and localized construction noise impacts will likely occur as a result of these activities. During daytime hours, the predicted effects of these impacts will be temporary speech interference for passers-by and those individuals living or working near the project. During evening and nighttime hours, steady-state construction noise emissions such as from paving operations will be audible, and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures (“slamming” of dump truck gates), etc., will be perceived as distinctly louder than the steady-state acoustic environment, and will likely cause severe impacts to the general peace and usage of noise-sensitive areas – particularly residences.

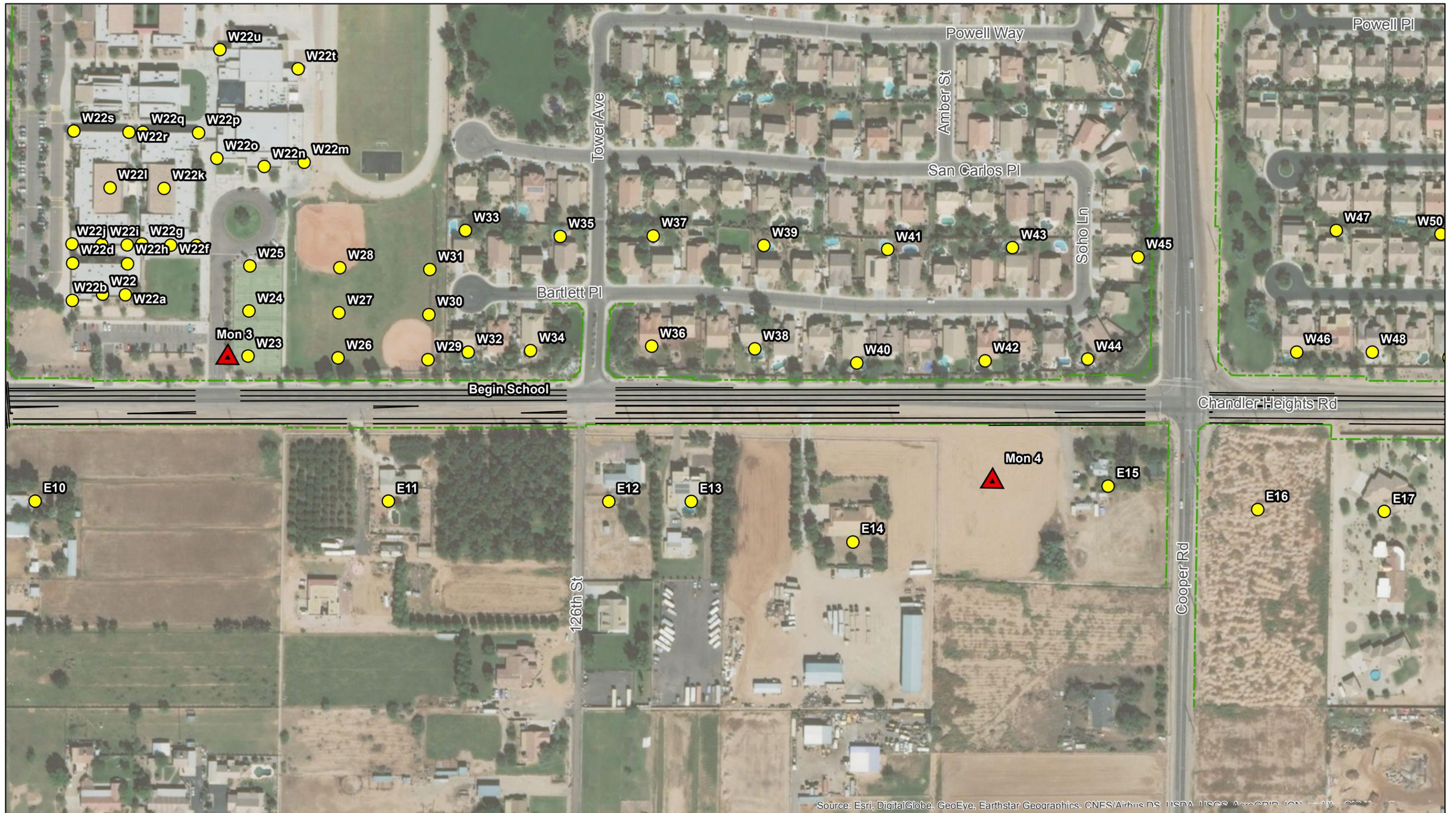
Extremely loud construction noise activities such as usage of impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the vicinity of those activities. Construction activities that will produce extremely loud noises should be scheduled during times of the day when such noises will create as minimal disturbance as possible.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications to the extent possible. These measures include, but are not limited to, work-hour limits, factory-installed mufflers, haul-road locations, elimination of “tail gate banging”, ambient-sensitive backup alarms, construction noise complaint mechanisms, and consistent and transparent community communication.

11.0 STATEMENT OF LIKELIHOOD

Consideration for noise abatement measures was not necessary because there are no receptors that approach or exceed the NAC of 66 dBA. A final determination of noise abatement measures will be made upon completion of the project design, the public involvement process, concurrence with the ADOT policy, and both ADOT and FHWA approval.

APPENDIX A – RECEIVER/MONITORING AND PRIVACY WALL LOCATIONS



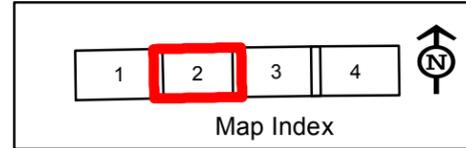
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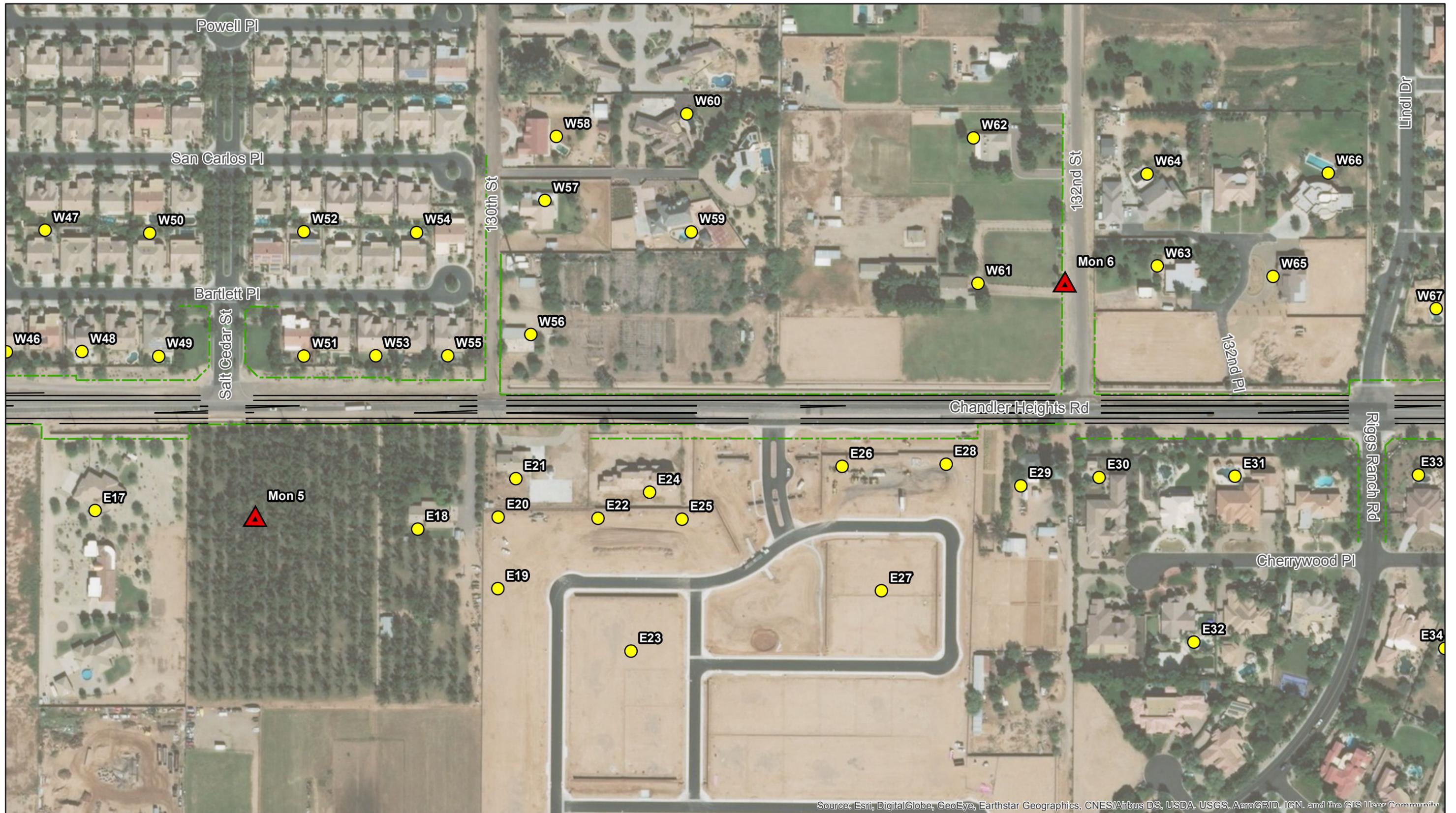


Revised: 4/2/2018
SOURCE: World Imagery; Kimley Horn (2018)

Legend

- Noise Receivers
- ▲ Monitoring Receivers





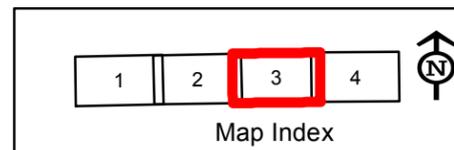
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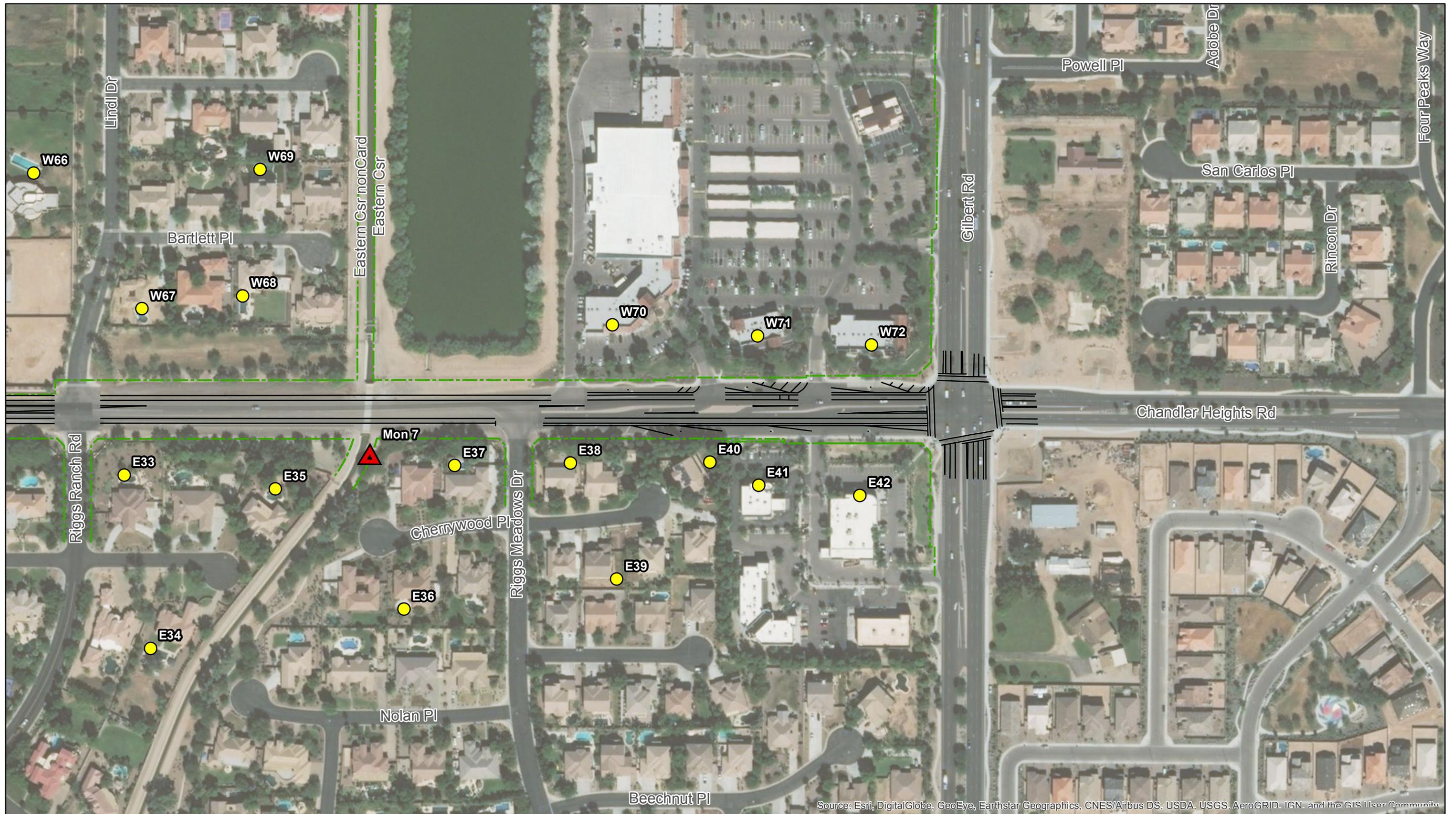


Revised: 4/2/2018
SOURCE: World Imagery; Kimley Horn (2018)

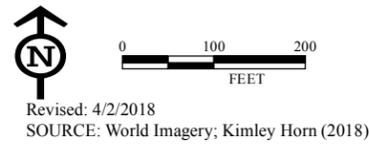
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- Noise Receivers
- ▲ Monitoring Receivers

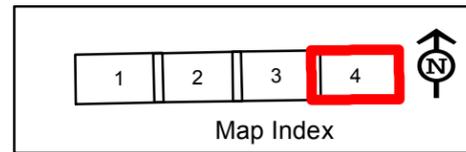




Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend
 ● Noise Receivers ▲ Monitoring Receivers



APPENDIX B - NOISE MEASUREMENT DATA

Chandler Heights Road, McQueen to Gilbert - Noise Monitoring Data

1	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway
	3/27/18	Clear	53	37%	SE 3 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes		

Receiver 1 - 33° 14' 02.09" N - 111° 49' 23.15" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	159	1	0	1	0	161	6:35:00 AM	6:50:00 AM	0:15:00	60.2	51.3	75.8
	1	HE	32	1	0	0	0	33						
	1	QE#PfTxhhq	185	5	3	0	0	193						
	2	ZE	139	2	1	0	0	142	6:50:00 AM	7:05:00 AM	0:15:00	60.3	50.00	74.8
	2	HE	37	0	0	0	0	37						
	2	QE#PfTxhhq	195	2	4	0	0	201						
	3	ZE	154	1	0	0	0	155	7:06:00 AM	7:21:00 AM	0:15:00	60.1	49.5	76.2
	3	HE	30	0	0	0	0	30						
	3	QE#PfTxhhq	188	3	4	0	0	195						
Total			931	12	8	1	0	952						

2	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway
	3/27/18	Sunny/Clear	55	35%	SE 4 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes		Below

Receiver 2 - 33° 13' 59.82" N - 111° 49' 10.40" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	107	0	0	3	1	111	7:31:00 AM	7:46:00 AM	0:15:00	69.4	47.7	78.6
	1	HE	58	1	0	0	0	59						
	2	ZE	107	3	2	2	0	114	7:46:00 AM	8:01:00 AM	0:15:00	69.1	47.0	79.5
	2	HE	56	0	1	1	0	58						
	3	ZE	102	2	0	1	0	105	8:01:00 AM	8:16:00 AM	0:15:00	69.3	47.6	79.1
	3	HE	54	1	0	0	0	55						
Total			484	7	3	7	1	502						

Traffic Counting Log

3	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway
	3/27/18	Clear Sunny	57	32%	SE 3 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes		

Receiver 3 - 33° 14' 01.70" N - 111° 48' 48.80" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	100	0	2	3	0	105	8:22:00 AM	8:37:00 AM	0:15:00	64.4	47.3	83.4
	1	HE	70	0	1	0	0	71						
	2	ZE	51	1	0	0	0	52	8:37:00 AM	8:52:00 AM	0:15:00	59.3	43.0	70.0
	2	HE	26	2	1	0	0	29						
	3	ZE	41	0	2	0	0	43	8:52:00 AM	9:07:00 AM	0:15:00	60.0	42.8	76.0
	3	HE	38	0	3	0	0	41						
Total			326	3	9	3	0	341						

4	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway
	3/27/18	Clear/Sunny	63	22%	SE 3 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes		

Receiver 4 - 33° 13' 59.29" N - 111° 48' 28.73" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	38	6	4	0	0	48	9:15:00 AM	9:30:00 AM	0:15:00	54.1	37.8	67.1
	1	HE	27	2	2	0	0	31						
	2	ZE	46	0	3	0	0	49	9:30:00 AM	9:45:00 AM	0:15:00	53.6	39.8	67.3
	2	HE	27	2	2	0	1	32						
	3	ZE	36	2	2	0	1	41	9:45:00 AM	10:00:00 AM	0:15:00	54.5	38.1	67.2
	3	HE	26	2	0	0	0	28						
Total			200	14	13	0	2	229						

5	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway	
		3/27/18	Clear/Sunny	64	21%	SSE 2 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes		
Receiver 5 - 33° 13' 58.64" N - 111° 48' 14.27" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	40	0	3	0	2	45	10:06:00 AM	10:21:00 AM	0:15:00	53.3	38.1	77.5
	1	HE	49	1	0	0	0	50						
	2	ZE	48	3	1	0	0	52	10:21:00 AM	10:37:00 AM	0:15:00	48.5	37.4	65.7
	2	HE	26	4	3	0	0	33						
	3	ZE	42	0	2	0	1	45	10:37:00 AM	10:52:00 AM	0:15:00	53.1	37.6	69.2
	3	HE	38	1	2	0	0	41						
	Total		243	9	11	0	3	266						
6	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway	
	3/27/18	Clear/Sunny	74	14%	WSW 8 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes			
Receiver 6 - 33° 14' 03.99" N - 111° 47' 53.15" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	86	0	0	0	0	86	4:54:00 PM	5:09:00 PM	0:15:00	56.0	40.2	76.6
	1	HE	125	0	4	0	1	130						
	2	ZE	80	0	0	1	0	81	5:10:00 PM	5:25:00 PM	0:15:00	56.1	45.0	71.7
	2	HE	119	0	0	2	1	122						
	3	ZE	87	0	1	0	0	88	5:25:00 PM	5:40:00 PM	0:15:00	56.2	45.6	72.4
	3	HE	122	0	0	1	0	123						
Total		619	0	5	4	2	630							
7	Date	Sky	Temp °F	Humidity %	Wind Speed/Dir	Project	Day Of Week	Staff	Meter	Batt Check	Calibraton	# Traffic Lanes	Receptor Above, Below Or Same Elevation As Roadway	
	3/27/18	Clear/Sunny	73	15%	WNW 7 MPH	Chandler Heights, McQueen to Gilbert	Tuesday	AN/MO	Larson Davis LXT	Yes	Yes			
Receiver 7 - 33° 14' 00.35" N - 111° 47' 37.42" W	Sample	Axis	Autos	Medium Trucks	Heavy Trucks	Buses	Motorcycles	Total	Start Time	End Time	Duration	LaEQ	LaMin	LaMax
	1	ZE	92	0	0	0	0	92	5:46:00 PM	6:01:00 PM	0:15:00	67.2	43.8	75.8
	1	HE	121	0	3	0	0	124						
	2	ZE	65	0	3	0	1	69	6:01:00 PM	6:16:00 PM	0:15:00	67.4	47.8	76.6
	2	HE	113	2	0	1	1	117						
	3	ZE	88	0	3	0	0	91	6:16:00 PM	6:31:00 PM	0:15:00	67.3	46.5	75.9
	3	HE	118	2	1	0	0	121						
Total		597	4	10	1	2	614							

APPENDIX C – TNM 2.5 TRAFFIC VOLUMES

Chandler Heights (McQueen to Gilbert) Traffic Volumes

SUMMARY OF RESULTS - EXISTING (2017)

	AADT Volume	Peak Hour Volume	Cars (98%)	Med (1%)	Heavy (1%)
West of McQueen	10,200	1,020	1,000	10	10
McQueen to Cooper	10,200	1,020	1,000	10	10
Cooper to Gilbert	10,800	1,080	1,058	11	11
East of Gilbert	10,800	1,080	1,058	11	11

SUMMARY OF RESULTS - NO BUILD (2040)

	AADT Volume	Peak Hour Volume	Cars (98%)	Med (1%)	Heavy (1%)
West of McQueen	15,300	1,530	1,499	15	15
McQueen to Cooper	15,300	1,530	1,499	15	15
Cooper to Gilbert	16,200	1,620	1,588	16	16
East of Gilbert	16,200	1,620	1,588	16	16

SUMMARY OF RESULTS - BUILD (2040)

	AADT Volume	Peak Hour Volume	Cars (98%)	Med (1%)	Heavy (1%)
West of McQueen	17,600	1,760	1,725	18	18
McQueen to Cooper	17,600	1,760	1,725	18	18
Cooper to Gilbert	18,640	1,864	1,827	19	19
East of Gilbert	18,640	1,864	1,827	19	19

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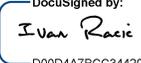
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